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THE AMERICAN FLAMINGO AND ITS CURIOUS NEST OF MUD.—[See page 102.]

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NEW YORK, SATURDAY, AUGUST 11, 1906.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

PUSHING A GOOD PRINCIPLE TOO FAR.

The opposition to the construction of an elevated loop through the east side to connect the Williamsburg and Brooklyn bridges is a clear case of pushing a principle, good in itself, to harmful extremes. The widespread objection to the construction of any more elevated railroads on Manhattan Island is a sound one, being based upon considerations of the health and comfort of the people and the architectural and æsthetic appearance of New York city, both of which would be further menaced by the erection of additional structures of this kind.

The proposal to build the Delancey Street elevated loop, however, contains an explicit proviso that the structure is to be considered as a purely temporary expedient for relieving the traffic congestion at the termini of the two bridges, and that as soon as a subway loop can be constructed to take its place, the elevated structure is to be removed.

It is not denied that the construction of the loop would be a disfigurement for the time being of the streets through which it would pass, or that it would be something of an obstacle to street traffic, or that it would seriously shut out light and air from the buildings. Against these drawbacks, however, is to be set off the enormous advantage that would immediately ensue to the many millions who travel between Brooklyn and Manhattan. Traffic movements would be expedited, the present congestion largely broken up, and the well-recognized evils that arise from the fact that the Manhattan end of the Brooklyn bridge, and to a less extent of the Williamsburg bridge, is a terminus, would be entirely removed.

FUEL AND WATER CONSUMPTION ON THE "LUSITANIA."

Since the launch of the "Lusitania" the British technical press has devoted an unusual amount of attention to this remarkable ship. One of our contemporaries, basing its calculations on the contract indicated horse-power of 65,000, estimates that this will mean a consumption of not less than 435 tons of steam per hour, and a corresponding consumption of 50 tons of coal in the same time. This would work out at a total of 1,200 tons per day. On the ground that for the economical working of the turbine it is necessary that the vacuum should be very high, it is estimated that about fifty times as much water must be passed through the condensers as the steam that is delivered to them, or say, 22,000 tons of water per hour, or 528,000 tons per day. For the combustion of the coal 700 tons of air must pass through the furnaces every hour, or 21,000,000 cubic feet.

These calculations of our contemporary Engineering are based upon what is probably a closely correct estimate of the coal consumption. The writer had the good fortune to spend many hours in the engine room of the "Deutschland" on the occasion of one of her record-breaking trips when she showed an average indication of over 37,000 horse-power and an average daily consumption of 672 tons of coal. This, it will be observed, is a smaller ratio of total coal consumption to total horse-power than is estimated for the "Lusitania"; but as the "Deutschland" burned only 1.3 pounds of coal per horse-power per hour for the main engines, and the marine steam turbine, at least in its larger sizes, makes greater demands on coal, we think the estimate of 1,200 tons of coal per day for the "Lusitania" will prove to be very near the mark. For a five-day trip this would call for a bunker capacity of not less than 7,000 tons—for some margin must be left for contingencies of breakdown, in which the time of passage might be greatly extended.

CANALS AS RATE REGULATORS.

In the field of transportation there is a decided revival of interest and activity in interior canal construction. Before the advent of the railroad the canal formed the most serviceable means for the transport of freight between important centers of industry. It had the advantage over the freighting wagon of being able to carry material in considerable bulk and at lower cost; moreover, under average conditions, it was a more rapid method of transportation. Although the canal interests maintained an active competition with the early railroads, the all-important question of time decided the question in favor of the latter and canal traffic declined, many of the lines falling into disrepair and finally into disuse.

The decadence of the inland waterway has been more complete in some countries than others, for in France and Germany there came, in course of time, a revival of activity and a new era of construction which has brought canal traffic up to the position of importance, both as a regulator of rates and an important auxiliary to the railroads, which it should properly fill. The canal system of Great Britain, on the other hand, has declined until it consists of a few inadequate and little-related lines, which are too ill-equipped and too insignificant to exert any serious influence upon the freight traffic at large.

At the present time a royal commission is engaged in an inquiry into the canal system of the country; but such commissions move slowly, and the necessity for individual action has led the individual interests of the great manufacturing counties of middle and northern England to take action at a conference held at the invitation of the Birmingham Chamber of Commerce. The points under consideration were, first, that in order to provide healthy competition with the railroads, it was desirable that a complete system of through communication by water should be provided between centers of commercial, industrial, or agricultural importance and between such centers and the sea; that in view of its national importance, such a system should be acquired and controlled by the government, or by a public trust in which the government should have the controlling vote; and that in either case the sinking fund and interest on capital expenditure should be guaranteed by the government. The scheme should prove sufficiently attractive to private capital to render any appeal to the government unnecessary; indeed, it is questionable whether to the heavy burden which it already carries, the national budget could add this additional heavy obligation.

Here in the United States, our canal system was never developed to the extent that obtained in Europe. The development of the country to its present proportions has taken place side by side with that of its railroad system; indeed, it may truly be said that our stupendous development in agriculture, commerce, and industry, has been made possible by the railroad. With the cheaper and more quickly constructed railroad available there was no inducement to undertake the construction of costly canals; and if we except the notable Erie Canal, and a few others of less importance, the railroads have been practically free from canal competition. The enlargement of the Erie Canal, which is now being actively prosecuted, is destined to raise that waterway to something of the importance that it possessed in its most flourishing days; and it is reasonable to expect that its success in regulating rates and redirecting traffic into the natural channels from which it has been turned by arbitrary discrimination, will prove a powerful stimulus to the extension of canal systems between the principal manufacturing and industrial centers of the country. Foremost among these will probably be the waterways connecting the Pittsburg district with the Great Lakes and the Great Lakes with the Gulf.

WITH THE BALTIC FLEET AT TSUSHIMA.

Accurate detailed information by eyewitnesses who are technically qualified to speak concerning the behavior of war material in great engagements is never available to the public until many months after the event. The Russo-Japanese war, and particularly the naval side of it, has been no exception; and it is only recently that independent outside observers have been making public the result of their experience and observation.

By far the best account of this kind that has come to our notice was published in the last issue of the Proceedings of the United States Naval Institute, by Lieut. R. D. White, of the United States navy. In an introductory note the lieutenant states that the account is compiled from information obtained from one who was present on one of the ships of the Russian fleet at the battle. As this observer had no station in battle, he was selected to observe and record the various events as they occurred, a duty which "he performed with admirable care and accuracy." Although for obvious reasons the writer does not give his name, he states that "his willingness to speak on the subject with honesty and without prejudice, his keen appreciation of the military strength and weakness of ships built and building, his power of observation in general and in detail" and his mastery of the principles of modern naval construction and warfare, lend to his statements the greatest value in the strong light they throw upon the theory and practice of modern naval design and construction. We cannot do more than briefly review this article in the Scientific American, but the full text with its illustrations will be found in the current issue of the Supplement.

The morning of May 27, 1905, is described as dawning raw and cheerless on the Baltic fleet as it steered for Tsushima Straits. The Russian sailors are spoken of as a hopeless band of men, huddled around the fire-room hatches or seeking shelter in some favoring lee about the deck, while a spirit of pessimism seemed to pervade the whole fleet. As day was breaking, a Japanese cruiser loomed through the fog, and the clicking of the wireless instruments on the Russian ships intimated that a message was being sent to Togo giving the position of the Russian fleet. Strange to say, no attempt was made to intercept or break up this message. Soon afterward the Russians sighted one of the Japanese armored cruisers, which for two hours kept abreast of the Russian battleships on the starboard side at a distance of about 8,000 yards. The fleet entered the battle at a speed of 9 knots and this was its standard speed throughout the engagement. When the Japanese fleet was sighted, it consisted of twelve ships in line ahead standing almost directly across the Russian course. The observer on the Russian ships speaks of their formation as being faultless and their speed sixteen knots an hour, a disparity in speed which seems almost incredible and must, of course, account largely for the baffling and overwhelming tactics displayed by the Japanese throughout the battle.

Without following the course of the conflict as seen from the Russian ship, we draw attention to some of the salient features. As the Japanese column cleared the path of the Russians, they turned and steamed parallel in a directly opposite course to that of the enemy and "then, judging his time with beautiful exactness, Admiral Togo countermarched and brought his entire fleet into action, opening fire at six thousand yards' range. As each ship made the turn, she opened fire on the battleship "Oslyabia" with results that were fearfully destructive. The forward turret was put out of action when she had fired only three shots. A shell striking the embrasure beneath one gun jammed the gun in its full elevation and by the force of its explosion lifted the top of the forward turret. The water line of the "Oslyabia" from the forward turret to the bow was unarmored. Five high-explosive shells each made an enormous hole in the bow plating, and the water, entering, brought the ship down until her three-inch battery gun ports were awash. Three twelve-inch shells striking in succession an armor plate on the water line amidships, first loosened, then tore it off, and finally opened a huge hole in the side of the ship. In one hour after the opening of the engagement the "Oslyabia" turned over and sank.

Early in the action a shell entered the embrasure in the forward turret of the "Suvaroff" and, exploding, ignited several bags of powder, with the result that the roof of the turret was blown off and landed on deck, leaning against the turret. These two embrasure accidents emphasize the necessity for using port shields to guard this vulnerable spot; and we are glad to note that in our later ships an excellent design of very heavy port shields has been fitted to the guns of the main battery. As further showing the terrific destruction of modern high-explosive shell, it is recorded that all the forward shell plating of the battleship "Suvaroff" above the armor belt was shot away nearly as far aft as the turret, causing the vessel to resemble a monitor, and at 2:25 P. M. (the firing opened at 1:55 P. M.) she left the line, ablaze fore and aft and unable to withstand longer the terrific bombardment. With the "Oslyabia" and "Suvaroff" gone, the "Alexander III.," sister to the "Suvaroff," received the concentrated fire of the Japanese fleet at a range of from 5,100 to 5,600 yards, and she was forced to turn to the eastward in the effort to escape it.

A remarkable and very disconcerting fact noted by the observer was the number of fires that broke out on board the new Russian battleships, and this in spite of the fact that woodwork had been eliminated as far as possible, in accordance with modern theories. On one of the new ships, the "Orel," thirty-four different fires broke out during the day. Several fires occurring in the hammocks stowed just forward of the bridge, drove the occupants from the conning tower. Hawsers proved to be exceedingly troublesome, catching fire easily, producing much pungent smoke, and being difficult to extinguish. One of these, burning abaft of the bridge, again drove all hands from the conning tower. The smoke also was drawn by the blowers into the forward fire room, and this compartment had to be abandoned. This last contingency is one surely that no naval architect had ever contemplated. The smoke also filled the port forward six-inch turret with smoke, which penetrated to the lower decks, causing consternation there. Another curious fact developed in the fight was that there was great danger of fire in the war-paint on the side plating of the ships; for when the "Alexander III." fell out the

war-paint over the whole of her side facing the enemy was ablaze.

In turn the "Borodino" and then the "Orel" were selected as the principal target. In six minutes the former was struck twelve times with 12-inch, and thirty to forty times with 6-inch and 8-inch shells. The eyewitness of this tremendous drama has this to say of high-explosive shells: "To realize the terrific effect of this shelling, one must consider that a shell filled with Shimose powder is really a small torpedo; that each 12-inch shell striking an unarmored portion made a hole 7 feet high and 6 feet wide; that the fragments of these shells were minute particles that filled the air like driving mist; and that a dense black smoke settled down after each explosion, blinding and suffocating all in the vicinity. One sailor is known to have been struck 130 times by fragments from a single shell."

The great lesson of the conflict, as deduced by this spectator, is that gunnery and tactics must ever be the determining factors in naval battles between equal forces. In the sortie of August 10, the Japanese made poor shooting. Between that date and the battle of Tsushima, no effort was spared to perfect their marksmanship. It is estimated that, between them, the 12-inch guns fired 1,275 shots, and of these 19.6 per cent were hits. The average range was 5,000 yards and the condition of the atmosphere hazy. Lieut. White remarks very aptly that this record is enough to make all who think, think hard. On the other hand, the Japanese had little to contend with in the way of interference by the fire of the Russians, the "Mikasa" being hit only a few times throughout the battle.

Although telescopic sights were used on the guns by the Russians, they were greatly interfered with by mist and spray and in some cases rendered quite useless. Coal had been stowed everywhere on the ships, and the shock of the shells and firing stirred up coal dust from corners and crevices, making it impossible to see either with or without the telescopes; moreover, shells falling short and striking the sea, deluged the ship with salt water and blurred the telescopes, leaving them salt-incrusted.

POISONOUS EGGS.

All substances are poisonous when they are injected in a certain quantity into the circulatory system of an animal. The weight of the substance injected as compared with that per pound of the animal forms what is called its toxicological value. Numerous experiments have been made with a large number of substances, especially by Prof. Bouchard, according to Cosmos, who has studied the toxicological value of the physiological media; but up to recent times no one had investigated the toxic value of eggs. This has now been done, however, by M. Loisel, who has experimented upon the eggs of the common hen, the duck, and the turtle.

M. Loisel's mode of operation is as follows: He takes the powdered yolk of a duck's egg, for example, treats it with a 20 per cent solution of salt, and injects into the veins of a rabbit until the animal dies. In order to kill a rabbit, it takes about 55 grains of the substance per pound of animal, say 180 grains for a rabbit of an average weight of 2¼ pounds. If an experiment be made with the same substance by injecting it into the general cavity, the toxicological value diminishes and the quantity required is from 375 to 450 grains.

The yolk of the hen's egg is less poisonous, and that of the turtle more so than that of the duck. The albumen of the egg also is poisonous, the toxicity increasing from the hen to the turtle. If we desire to know the cause of the toxicity, we must seek it in the chemical composition of eggs. These are composed of the yolk and the white. The white represents typical albumen soluble in distilled water, and coagulable by heat. The yolk contains a special substance, ovovitelline, which is insoluble in water, soluble in dilute saline solutions, and associated with organic phosphorated compounds, called lecithines, and cyanic ferruginous compounds called hematogens, at the expense of which is formed the hemoglobine of the blood of the young chicken.

It is to nervine, a substance allied to the lecithines, and the toxic power of which is very great and which exists in extremely small quantity in the yolk, that is due the toxicity of eggs, as also to toxalbumens (bodies as yet little known), which are highly poisonous. According to M. Loisel, all the toxic substances of eggs act upon the central nervous system.

What is of consequence for us is not the toxicological value of eggs from an experimental viewpoint, but the toxic value of eggs ingested by the natural tracts, the cause of the putrefaction of eggs, and the physiological phenomena to which putrified eggs can give rise.

Eggs, even when very fresh, give rise to severe cases of poisoning, although this depends on individual susceptibility, and according to M. Linosier, is more apt to occur in dyspeptics. The quantity ingested may be exceedingly minute, and the toxic symptoms may exhibit themselves even in a young child. Mention is made of a fourteen-months-old child, who, in consequence of the absorption of an egg, had a nettle-rash eruption, and, two weeks afterward, a second eruption caused by a cream that had been given to it.

Such phenomena generally exhibit themselves by the appearance of urticaria. The substance that produces this, and is called ovotoxine, is analogous to those that cause similar effects and are met with in strawberries, mussels, and sea fish, which give rise to accidents known by the name of botulism. We know that some individuals are very sensitive to the action of these substances.

There is here also a receptivity of the individual, and, as a consequence of these phenomena, eggs cannot be employed in cases in which there is a lesion of the digestive apparatus at some points of its passage, especially in typhoid fever, in which the intestine offers a wide surface of denudation into which the various toxines of the eggs might infilter. In all such complaints, we should prefer milk sterilized and boiled, and as free as possible from all toxines and microbes.

Along with the ingestion of normal eggs we may mention that of poisonous ones, of which neither the taste nor odor gives any hint as to their toxicity. This phenomenon is due principally to microbes that have entered the egg at the time of its formation, that is to say, into the very ovary of the duck and hen.

A remark apart must be made in regard to the toxicity of the eggs of the duck. This fowl as a general thing lives amid somewhat dirty environments, and it is possible for a considerable quantity of organic matter in decomposition to enter their organs and infect them. The egg in forming becomes contaminated with these substances rich in microbes, and thereby becomes toxic.

It is to eggs thus contaminated that may be attributed those toxic phenomena sometimes exhibited by creams. These latter, in fact, are not submitted to a very high temperature during their manufacture, while a temperature of at least 60 deg. C. would be required to destroy the pathogenic microbes of the egg. This is not compatible with culinary processes. From this point of view, since non-fecundated eggs are less toxic than fecundated ones, it is important to reject the latter as food for children and invalids. Finally, a third way in which eggs may become toxic after they are laid is by the penetration of microbes through the porous shell. These microbes have been studied by Zordenkofer, who divides them into two groups. The first group, which gives rise to a putrefaction which results in the production of sulphureted hydrogen, is the most common alteration. Ten species of this group have been described under the name of *Bacillus oogenes hydrosulfurens*.

The second group gives rise to a slightly different putrefaction the odor of which recalls that of human excrement. This putrefaction, which is much more rare, is produced by a bacterium called *Bacillus oogenes fluorescens*. All these organisms need air for their development. It is therefore necessary to keep eggs from contact therewith by varnishing the shell or coating it with vaseline or milk of lime.

The use of decayed eggs is extremely dangerous. Dr. Cameron has called attention to a case of poisoning that happened in a convent at Limerick, Ireland, in 1895, after a meal at which had been served a cream in which a bad egg had been used. Seventy-four women who partook of the meal were poisoned, and four of them died.

An endeavor has been made in this article to recapitulate the causes of the poisoning of eggs and the damages to the system that may be caused by eating them. But it must be said that poisoning by eggs is of relatively rare occurrence, and that that produced by spoiled ones is exceptional.

WHAT THE GLIDDEN TOUR PROVED.

At the termination of the third annual tour of the American Automobile Association at Bretton Woods, N. H., on the 28th ultimo, thirteen out of forty-eight contestants for the Glidden trophy still had perfect scores. The one car that was penalized two points on this day lost these points on account of an unnecessary stop, and solely through the carelessness of its occupants. Besides these thirteen perfect-score cars, one car had one, and two had two points each, while three had three and one five points against them. Seven cars had from six to fifteen points charged against them. Besides these, two contestants for the Deming trophy made perfect scores. Thus, in all, fifteen cars made perfect scores; fourteen had penalizations ranging from one to fifteen points.

No one who has not been over the route that was traversed, or at least some of the worst portions of it, at high speed in an ordinary touring car can realize what a wonderful performance was made by these twenty-nine cars. The shocks and strains they encountered were undoubtedly more severe than are those received by racing cars traveling at extremely high speed on good roads. None but the best springs and axles can stand such jolts and bumps as the touring cars received in endeavoring to adhere to the schedule. This, it is true, was lowered, after the first few days of the tour, from an average speed of 18 miles an hour to one of 15; but on such flinty, sandy, and rough roads as were met with, it was difficult to make up time lost from punctures or other troubles, even with this low average speed. The plan adopted by most of the contestants was to run as fast as they could up to each checker, spend the fifteen or twenty minutes they had gained in making repairs, pass the checkers on time, and start full tilt for the next control. If several punctures or blowouts were had in a single control, they were almost sure to lose points. One 30-horse-power touring car, for instance, after having its third puncture in one control, made a run of 10 miles in 19 minutes, running on a flat front tire of the mechanically-fastened type. The inner tube was melted, and the rim was so hot as to burn the hands of the men when they attempted to remove the tire. During some stages of the run, new axles and springs were put on several of the cars, and the time thus lost was successfully made up. As an endurance test and obstacle race, the tour was unsurpassed.

Among the forty-one contestants for the Glidden and Deming trophies that finished the tour, no less than twenty-five different makes of cars are represented. Of the four foreign cars that started, but one, Mr. S. B. Stevens's 50-horse-power Darracq, finished. Nearly all of the cars were four-cylinder machines of from 24 to 50 horse-power. The only exceptions were double-opposed-cylinder Reo and Maxwell cars of 16-horse-power, the small Maxwell speedster of 12 horse-power (used as an advance confetti car), and a single-cylinder Oldsmobile runabout of 8 horse-power, used as a repair car. A half dozen White steam machines of 18 horse-power also competed. On the last day's run Mr. Walter White's machine was ditched, in order to avoid running into a wagon. The gasoline tank was punctured on a rock, and the car caught fire, and was completely demolished. The five air-cooled cars in the tour proved their worth, two of them, the 40-horse-power Knox (which carried five to seven people) and the 30-horse-power Marmon, winning perfect scores. In this connection a word of praise should be given the 16-horse-power double-opposed-cylinder Knox baggage wagon. This was the only commercial vehicle in the tour, and it successfully transported 3,000 pounds of baggage throughout the event.

Above all else, the tour has demonstrated that American machines will stand fast driving on rough forest roads without serious damage to the cars or their mechanism. Engine and gear troubles have practically disappeared, and the only things that are to be feared are the breakage of springs and axles and the giving out of the tires. Numerous shock-absorbers were tried out and found wanting in this test; and were it not for the pneumatic tires, which have been greatly improved during the past two years, such a tour would be impossible of accomplishment.

Immediately after his car had been released, Ernest Keeler, who drove a 30-horse-power Oldsmobile touring car, left Bretton Woods for a record run to New York city. The start was made at 12:10 on Sunday the 29th ultimo, and the car arrived at Herald Square on Monday at 2:28 P. M. The elapsed time was thus 26 hours and 18 minutes. The actual running time, however, was but 21½ hours, and the average speed was 24 miles an hour. During the night run from Concord, N. H., to Springfield, Mass., an average of 30 miles per hour was made. The car covered 16 5-6 miles per gallon of fuel (the consumption being 30 gallons), while three-quarters of a gallon of oil is said to have been used. No water was put in the radiator during the run, although the motor was running with the car stationary for over five hours. The motor was not stopped from 12:10 P. M. on the 29th until 2:45 P. M. the following day, thus making 26 hours and 35 minutes of continuous operation—certainly a good demonstration of motor reliability. Probably the motors of many of the other contesting cars would have been capable of a like performance, so reliable in operation have the motors of most gasoline automobiles now become.

THE COLOR OF WATER.

It was long ago discovered that the natural color of pure water is blue, and not white, as most of us usually supposed. Opinions have not agreed on the cause of the green and yellow tints; these, it has been discovered by W. Spring, are due to extraneous substances. Dissolved calcium salts, though apparently giving a green tint, due to a fine invisible suspension, have no effect on the color of the water when adequate precautions are taken. The brown or yellow color due to iron salts is not seen when calcium is present. The green tint is often due to a condition of equilibrium between the color-effect of the iron salts and the precipitating action of the calcium salts.

Orders for 562,000 tons of steel rails have been booked ahead by American railways for 1907. These figures include the contracts placed by the Northern Pacific, Great Northern, Chicago, Milwaukee, and St. Paul, Chicago, Burlington, and Quincy, Illinois Central, and the Wisconsin Central railroads.

A NEW SENSITIVE MICRO-ELECTROSCOPE.

BY A. FREDERICK COLLINS.

The instrument here illustrated and described is essentially a gold-leaf electroscope, in which only a single movable leaf is employed, repulsion taking place between this and a prolongation of the wire which supports it.

In Fig. 1, *C* is the gold leaf, which is cut in the form of a very narrow strip, and *D* is the wire supporting it. This wire is insulated by a bead of sulphur, *A*, from another wire, which is seen passing up through an ebonite plug at the top of the instrument, and may be called the "upper" wire. By means of this wire the gold leaf, *C*, and the wire, *D*, can be put in connection with bodies outside the instrument.

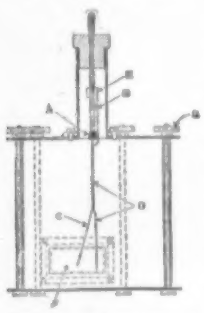


Fig. 1. Diagram of the Electroscope.

Normally, there is no electrical connection between this upper wire and the wire, *D*, contact being established when desired through a small key, *B*, which can be actuated from outside the case by means of a magnet. When the instrument has been charged the magnet is withdrawn, so as to break the connection between the gold leaf and the outer knob of the instrument. The latter may then be maintained at the original potential of the gold leaf, so that the observed loss of charge of the gold leaf is wholly due to leakage through the space within the case of the instrument, any defect from perfect insulation tending to give too low a value for the leakage. This is the arrangement used by Mr. C. T. R. Wilson, M.A., F.R.S., the designer of the micro-electroscope, in his experiments on the ionization of atmospheric air and on radio-active rain.

The instrument may be surmounted by a terminal, which can be turned into three positions. In one of these positions it is insulated, in another it is connected with the "upper wire," while in the third position it is connected both with the "upper wire" and with the case of the instrument. The case is also fitted with an independent terminal.

The deflections of the gold-leaf strip are observed through a microscope provided with a micrometer eyepiece, as shown in the photographic view, Fig. 2; and so long as the instrument remains undisturbed, the readings obtained agree well, and will indicate small fractions of a volt. The whole instrument is inclosed in a metal case, in which are inserted two small glass windows for purposes of observation.

For enabling the ionizing agent to exert its influence upon the air within the electrometer, two other openings are provided, one in the side and one at the bottom of the case. Both of these are ordinarily covered by thin paper, which is a sufficiently good conductor to form part of the conducting case, while it offers no appreciable obstacle to the passage of most types of ionizing rays. The side opening, when not in use, can be further protected by a brass shutter, while the bottom opening is so arranged that the paper diaphragm can be readily replaced by a diaphragm of any desired substance.

ELECTRIC HEATING FABRICS.

BY DR. ALFRED GRADENWITZ.

While electric heating is being more widely adopted, especially for industrial purposes, it may be said that up to the present it has been applied only in a small way to domestic uses. An interesting novelty recently designed by C. Herrgott, of Valdoie, near Belfort, France, will, however, doubtless contribute in some degree to a more general use of electric heating. Mr. Herrgott has invented what he calls *thermophile* fabrics, intended primarily for producing heat of a mild temperature. This result is insured by a convenient combination of a textile and a conductive thread, which latter is suitable for all fabrics, and can be worked in any weaving loom. The textile part alone is submitted to traction when stretched, while the conductive thread is free from any strain. In proportion to its small cross section it presents a large heating surface. The thread is very supple, and can be made in all sizes and combined with all textile materials.

The woven electrothermic threads are, moreover, sufficiently fine to become their own cutouts in case of any imprudence on the part of the operator; the fabrics are regulated to avoid any short-circuiting in their use. The great number of electro-thermic wefts composing a circuit renders it possible to produce between two neighboring wefts a potential difference of only half a volt to one volt at the most. In case of multiple circuits, these various units receive their current by especially insulated collector wires, a single pole of which is placed in each selvage of the fabric; the various circuits of the same fabric are thus arranged in weaving so that the difference of potential becomes *nil* between the neighboring wefts of two successive circuits. There is therefore every security against short circuits; the fabrics may even be wetted and then dried by the current itself.

The electrothermic wires are perfectly hidden, and almost invisible in the fabrics. They remain intact in spite of any manipulations to which the fabric may be subjected. As they terminate at a suitable distance from the edges of the fabric they cannot be affected by wear. The selvage collector wires can be designed with or without an external rheostat for coupling to multiple circuits, for the purpose of obtaining various temperatures.

The advantages of this process of heating will be readily seen. It is free from any danger of fire or accident; and it cannot produce any greater heat than that it has been designed for. Moreover, it is a very hygienic process of heating, disengaging neither smoke nor gas, while borrowing no elements from the atmosphere. Thermophile carpets warm by contact, producing a mild and absolutely uniform temperature. They are generally designed for giving a temperature of 70 deg. to 95 deg. F. above the surrounding temperature, but evidently can be made for all temperatures.

Thermophile fabrics will be found specially useful on account of the numerous medical applications they permit, e. g., in the heating of operating tables, incubators for newly-born babies, massage rollers, etc. They are valuable also in connection with dry or wet compresses applied to the limbs or abdomen, producing a very mild and constant heat.

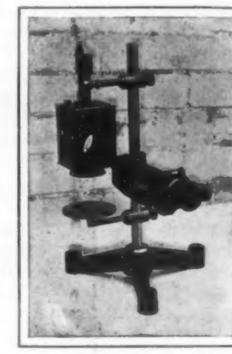
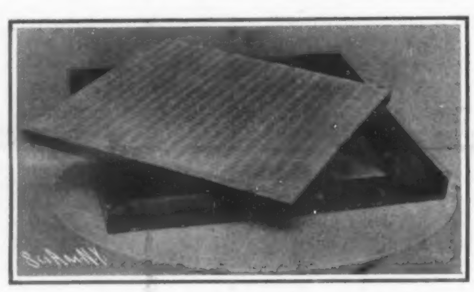


Fig. 2.—General View of the Electroscope.

By the use of woven or knitted thermophile fabrics, heated by an electric current, any physician can obtain a hot-air bath. These fabrics may be made antiseptic by a current of suitable tension, raising them in a few minutes to a temperature of from 250 deg. to 300 deg. F.

Specially-arranged thermophile fabrics finally permit a number of industrial applications, e. g., the filtering of cold, fatty, and syrupy matters (the filter fabric itself providing the heat necessary for the operation). Driers, finishers, and burnishers heated by thermophile fabrics have been found useful, the thermophile being employed either alone or with the interposition of polished metal plates for glazing. Drying rollers heated by thermophile fabrics, and even endless thermophile cloths, are used in paper works, where electric current as a rule is in abundance. The same may be said of paper calenders or drying rollers in paper works, bleaching works, or dye houses, which apparatus are conveniently surrounded by a thermophile fabric, either alone or in connection with a thin metal plate.

In electrically-operated tramways and railways, and in electromobiles, thermophile carpets, either alone or in connection with a heating plate, are used to advantage for providing a most comfortable heating effect to the passengers.



Foot Warmer.

Local Perspiration Produced by Thermophile Knitted Fabrics.

Official Meteorological Summary, New York, N. Y., July, 1906.

Atmospheric pressure: Highest, 30.40; lowest, 29.69; mean, 29.98. Temperature: Highest, 89; date, 10th; lowest, 61; date, 7th; mean of warmest day, 80; date, 17th; coldest day, 69; date, 7th; mean of maximum for the month, 81.8; mean of minimum, 67.9; absolute mean, 74.8; normal, 73.9; average daily excess compared with mean of 36 years, + 0.9. Warmest mean temperature for July, 78, in 1901; coldest mean, 70, in 1884. Absolute maximum and minimum for this month for 36 years, 99, and 50. Precipitation: 3.21; greatest in 24 hours, 1.39; date, 3d and 4th; average for this month for 36 years, 4.47; deficiency, —1.26; greatest precipitation, 9.63, in 1889; least, 1.26, in 1893. Wind: Prevaili . direction, south; total movement, 6.506 miles; average hourly velocity, 8.7 miles; maximum velocity, 55 miles per hour. Weather: Clear days, 5; partly cloudy, 16; cloudy, 10; on which 0.01 inch, or more, of precipitation occurred, 13. Thunderstorms: 3, 4, 9, 10, 17, 21, 22, 24, 28 and 29.

The coefficient of expansion of concrete, of the proportions 1 : 2 : 4, by heat has been determined as 0.0000055 for 1 deg. F., which is almost the same as that of untempered steel, which is 0.0000060.

Coverings, Knitted Fabric, Gloves.

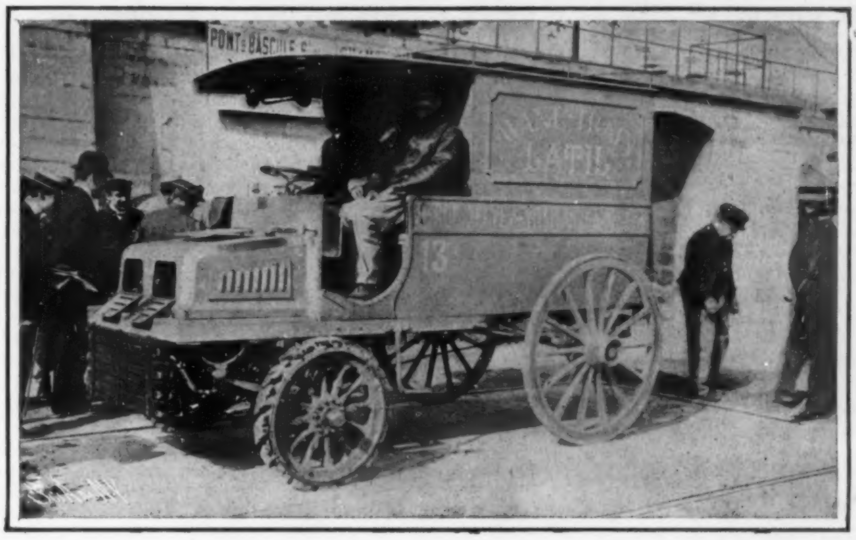
Coverlets and Oriental Rugs.

Heavy and Light Fabrics Covered or Uncovered.

ELECTRIC HEATING FABRICS.

NOVEL COMMERCIAL VEHICLES IN THE RECENT FRENCH TEST.

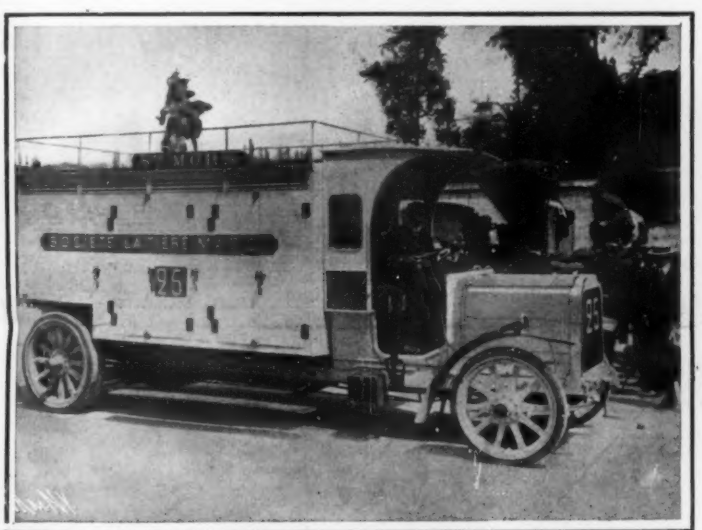
The automobiles shown in the accompanying illustration are some of the most novel types which participated recently in a contest for commercial vehicles organized by the Automobile Club of France. The Latil fore-carriage seen at the top of the page shows the latest attempt of the French designer to perfect an attachment for converting an ordinary horse-drawn delivery wagon into a motor-propelled vehicle by removing the regular front axle and substituting one with motor-propelled wheels. In the present instance these wheels are shod with peculiar sectional solid rubber tires. The fore-carriage has a two-cylinder, 12-horse-power, gasoline motor of 3.464 inches bore by 5.118 inches stroke, the normal speed of which is 1,000 revolutions per minute. The weight of the wagon, empty, was 3,946 pounds, and the load carried was 3,086 pounds. An average speed of 9.32 miles an hour was made throughout the 267-mile test, while the gasoline consumption for the last day's run of 40.4 miles (during which the consumption of all the vehicles was tested) was the least of any in its class, being but 0.146 liter per ton-kilometer of useful load (or 0.06 of a gallon per ton-mile). Besides the delivery wagon shown there were two still larger Latil fore-carriage trucks which weighed 9,766 and 13,448 pounds respectively, including their loads of 4,532 and 8,140 pounds. These vehicles averaged 7.61 and 6.93 miles an hour. These vehicles also were at the head of their respective classes (that for a useful load of from 4,409 to 7,716 pounds and that for vehicles carrying more than 7,716 pounds) as far as gasoline consumption was concerned, as the former consumed only 0.168 liter per ton-kilometer (0.071 gallon per ton-mile) of useful load, while the latter consumed only 0.095 liter of gasoline per ton-kilometer (0.04 gallon per ton-mile) of useful load. The best previous record is that made about a year ago by a German Daimler truck which consumed 0.028 gallon per ton-kilometer as against the heavy Latil's 0.025. All three fore-carriages were fitted with two-cylinder motors, the horse-powers being respectively 12, 14, and 28. The demonstration showed the remarkable efficiency of this type of vehicle in which the horse is replaced directly by the motor.



The 1¾-Ton, 12-Horse-Power Latil Fore-Carriage Delivery Wagon.

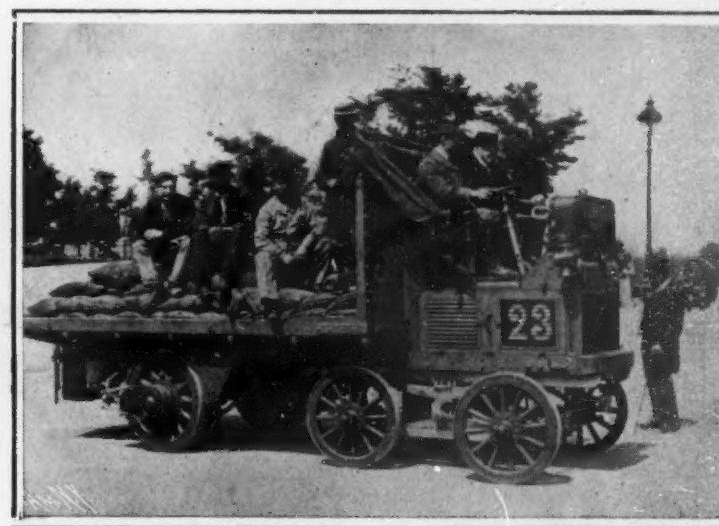
A new form of solid sectional tire is shown on the front wheel.

Two other interesting vehicles are the Janvier six-wheeled truck and the Mors refrigerator milk wagon. The former vehicle has a four-wheeled bogie at the front. This bogie is arranged to turn like that of a locomotive. The rear wheels, which are chain-driven from a countershaft, are fitted with a peculiar type of double-band brake, which is applied to the wheel hub. The Janvier truck has a three-cylinder, 24-horse-power motor, having a bore of 5.511 inches and a stroke of 5.905 inches and fitted with low-tension magneto ignition. The truck shown weighed, loaded, 28,660 pounds. Its average speed was 5.06 miles an hour. The Mors refrigerator car is a huge vehicle intended for the transportation of milk. Its total weight empty is 10,350 pounds, the refrigerating box alone weighing over 1 1-3 tons. The useful load carried was 4,409 pounds, and the total weight was 14,759 pounds. A 28-horse-power four-cylinder motor, having a normal speed of 1,000 revolutions per minute, was employed. The vehicle made an average speed of 6.21 miles an hour.



A 28-Horse-Power Mors Refrigerator Milk Wagon. Weight of Wagon, 5 Tons. Capacity, 2 Tons.

Note the twin solid rubber tires on the rear wheels, for carrying the exceedingly heavy weight.



The 3-Cylinder, 24-Horse-Power Janvier Truck, Fitted with Novel Steering Bogie.

A peculiar form of hub brake is to be noted on the rear wheel. Loaded as shown the machine weighed over 14 tons.

The Austral motor-tricycle, or tri-car, shown at the bottom of the page, is the same machine and driver that recently won the Tour de France. Three of these little machines were at the head of their class. They are fitted with single-cylinder motors of 4½ horse-power and have a chain-drive to the rear wheel, in the hub of which is placed a two-speed gear. The radiator in front of the handle bar serves to remove the heat from the cooling water used around the engine cylinder. The basket in front is used as a package carrier. These machines are found very useful by small dealers for delivering packages. Their average net weight was 760 pounds, and their average speed 16½ miles an hour. The average load carried was 114 pounds, and the average weight, loaded, 874 pounds. A similar machine, the Contal, the weight of which loaded was 769.4 pounds and the load carried 132¼, used alcohol for fuel and showed a consumption of 0.839 liter per ton-kilometer (0.35 gallon per ton-mile) of useful load.

Besides the trucks and other freight-carrying vehicles, there were no less than four omnibuses entered in this test. Two of these, the 40-horse-power Brillié and the 35-horse-power Clement, had a carrying capacity of thirty persons, weighed loaded 14,164 and 11,177 pounds, and made an average speed of 14.66 and 13.42 miles an hour. Two others, the Clement I. and the Delahaye, with a carrying capacity of from twelve to twenty-four persons and a total weight, loaded, of 7,495 and 7,319 pounds, made average speeds of 16.22 and 13.04 miles an hour. The large Brillié omnibus, which is similar to those now being run on the streets of Paris, used alcohol for fuel, and in the test consumed 0.2 liter per ton-kilometer (0.085 gallon per ton-mile) of passengers carried. The live load amounted to 4,684 pounds. The 24-horse-power Brillié delivery wagon, weighing, loaded, 11,034 pounds, of which 5,780 represented the load, also used alcohol and showed a consumption of 0.177 liter per ton-kilometer (0.05 gallon per ton-mile) of useful load

The 4½-Horse-Power Austral Delivery Tricycle.

Three of these machines made an excellent showing.

NOVEL TYPES OF FRENCH COMMERCIAL AUTOMOBILES.

carried. A still larger Brillié truck, which was run on gasoline at an average speed of 10.37 miles an hour, had a consumption of 0.11 liter per ton-kilometer (0.046 gallon per ton-mile) of load carried. The consumption of alcohol was thus shown to be somewhat greater per ton-kilometer of useful load carried than when gasoline was used.

HOW ECLIPSES OCCUR.

BY PROF. FREDERIC R. HONEY, TRINITY COLLEGE.

In the endeavor to obtain a clear understanding of how eclipses occur, it is necessary to know the form of the moon's path in space, which is the resultant of two motions, viz., that of her orbital motion round the earth, and of the revolution of the latter round the sun.

The popular conceptions of this path are frequently erroneous, and are illustrated in Figs. 1 and 2. The piece *a* rotating about the fixed center *S*, which represents the sun, carries a disk *b* which rotates round the center *E*, representing the earth.

On the periphery of this disk is a point *M*, representing the moon, which revolves round *E*, and describes the moon's path. In Fig. 2 this curve forms a loop, due to the rapid rotation of the disk as compared with the angular motion of *a*.

Fig. 1 represents the curve when the disk rotates more slowly; and *M* describes a sinuous path which crosses and recrosses the earth's orbit. This approaches more nearly the form of the moon's path; but it differs very widely from the true one, because in the illustration the radii of the orbits, and the relative orbital velocities of the earth and moon, are not correctly represented. The mean radii are respectively 92,900,000 and 238,840 miles. Dividing one by the other, $\frac{92{,}900{,}000}{238{,}840} = 389$; i.e., the earth's mean orbit radius is three hundred and eighty-nine times as long as the moon's. They are correctly proportioned in Fig. 3, which is a plot of the earth's orbit for about one-half of the month of August, 1906.

The position of the earth on August 4 and the dates that follow is the center of the circle the circumference of which represents the moon's orbit drawn to the same scale. The moon *M* is situated at the extremity of the radius of the circle. The earth, moving at the rate of eighteen and a half miles a second, travels each day a distance of about one million six hundred thousand miles, or three and a third times the diameter of the moon's orbit, while the latter, moving in her orbit at the rate of about five-eighths of a mile a second, revolves round the earth daily at an average of a little over 13 deg.

The relative positions of the sun, the earth, and the moon are shown for August 4, the date of a total eclipse of the moon. The sun is situated in the direction of the arrow, the earth at the center of the circle, and the moon at *M*. They are in the same straight line. If we place this page in a horizontal position, and regard it as representing the plane of the ecliptic—i.e., the plane which passes through the centers of the sun and earth—the moon must be in or near the plane of the ecliptic, that it may be possible for an eclipse to occur.

This will be evident by referring to Fig. 4, which shows the plane of the ecliptic, the plane of the moon's orbit, and the earth and the moon *M*.

M' and M'' represent two views when the center of the moon is in the plane of the ecliptic, i.e., when she is at one of her nodes. The earth and moon are shown at M' by concentric circles; while the distance from M' to M'' measures the mean radius of the moon's orbit. The shadow area is inclosed by the dotted lines drawn from the circumference of the sun's disk tangent to the earth, and indicates the limit within which a total or partial eclipse may occur.

When the moon is at or near M'', the eclipse is total; when at M''', partial; and at M'''' no eclipse occurs.

The moon at each of the dates August 4 to 20 (Fig. 3) is at the extremity of the radius of the circle representing her orbit, and her revolution round the earth is shown until she reaches her position on August 20. Connecting these points, the dotted line represents her path which is below the plane of the ecliptic.

A partial eclipse of the sun occurs on August 19, when the earth, the moon, and the sun (Fig. 3) are again in the same straight line.

The diameter of the sun is 866,400 miles; dividing this by 389—the length of the earth's mean distance in terms of the moon's mean orbit radius—$\frac{866400}{389} =$ 2,227.

A disk 2,227 miles in diameter would eclipse the sun. The moon's diameter is 2,162 miles. Therefore, under these conditions, if the three bodies were in the same straight line, we should have an "annular" eclipse of the sun, shown at Fig. 5; the larger circle representing the sun, and the smaller one the moon.

If the sun should be at his minimum distance from the earth, and the moon at her maximum distance, Fig. 6 would represent their apparent relative diameters—a more pronounced annular eclipse.

If the moon were at her minimum distance, and the sun at his maximum distance, Fig. 7 would show their apparent dimensions; the larger circle representing the moon, and the smaller one the sun—a total eclipse of the sun.

The moon's center will be in the plane of the ecliptic on August 18 (the ascending node) before the three bodies are in the same straight line as shown at *M* on the 19th.

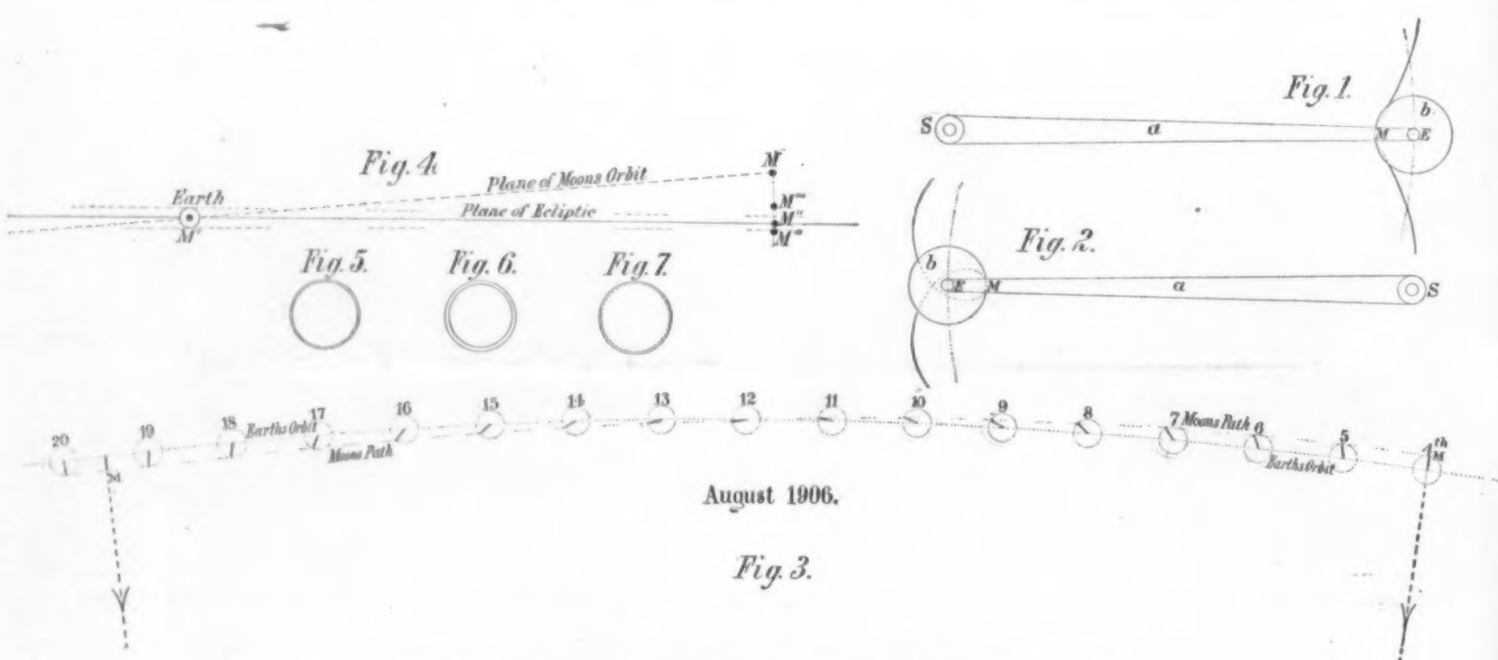
Therefore it cannot be a "central" eclipse on that day. If the earth's orbit were plotted to include the date July 21, when another partial eclipse of the sun occurred, we should have an exhibit of the moon's path somewhat similar to that of Fig. 3. This has been omitted for lack of space.

The sun subtends on the average an angle of about thirty-two minutes, with a variation of about half a minute during the year. This is due to the varying distance between the earth and the sun, which amounts to about three million miles.

The moon subtends an average angle of about thirty-one and a half minutes, with a variation of about two minutes. These variations are exhibited in Figs. 5, 6, and 7.

To obtain some conception of the relative dimensions of the sun, the earth, and the moon, and the distances that separate them, it should be noted that the diameter of the sun—which is one hundred and nine times that of the earth—if drawn to the same scale as Fig. 4, would be equal to three and five-eighths times the distance between the earth and the moon ($= M'\ M''$); and the sun's distance would be represented by a measurement equal to three hundred and eighty-nine times this unit.

The sine of 32 deg. = 0.0093. If we multiply this by 108, $0.0093 \times 108 = 1.00$, we discover that a circular disk of one inch diameter placed 108 inches (= 9 feet) from the eye will eclipse the sun or the moon.



HOW ECLIPSES OF THE SUN AND MOON WILL OCCUR IN THE MONTH OF AUGUST.

Another Alpine Tunnel.

Consul Edward Higgins, of Berne, reports that the legislature of the Canton Berne has accepted the project for a trunk line called the "Lötschberg," with electricity as motor power, to pass through the Bernese Alps and connect at Brig with the Simplon.

This new road will require five and one-half years to build, and necessitates a tunnel 13½ kilometers (kilometer = 0.62137 mile) long out of an entire length of 56 kilometers. The cost will be about $17,100,000. The steepest gradient will be twenty-seven one-thousandths. It will serve as the most direct means of communication between northern Italy (Milan and Genoa) and the vast district lying to the north and northwest of Switzerland. It will shorten the approach to the Simplon, that now must be reached *via* Lausanne, and will compete with the Gothard tunnel railroad. In addition to its value as an international trunk line it will prove of vast commercial importance to central Switzerland, and particularly to the Canton and city of Berne, by affording a direct line with the south that now has to be reached by means of the Gothard on the east or through the Simplon, which requires a roundabout deviation *via* Lausanne on the west. The road that has to be constructed will commence at Frutigen, a town near Spiez, a few miles from the lake of Thun, which is in direct communication with the towns of Thun and Pontarlier and with the cities of Berne and Basel. It will merge into the Simplon at Brig and virtually form the completion of that great project. The distance from Frutigen to Brig will be 56 kilometers, from Spiez to Brig 71 kilometers, and from Berne to Brig 113 kilometers. From an international standpoint Paris will be 15 miles nearer the cities of Italy than *via* the new Lausanne-Simplon tunnel route and about 100 miles nearer than *via* Gothard. From Calais northern Italy can be reached with 52 miles less travel than by Lausanne, through the Simplon.

A federal concession was granted covering the Lötschberg in 1891 and amended in 1897. The Canton has turned over its concession to a syndicate, and the cost will be borne by issuing subvention shares, $4,000,000; preferred shares, $4,600,000; 4 per cent first-mortgage bonds, $5,600,000; and 4½ per cent second mortgage bonds, $2,900,000, or a total of $17,100,000. The subvention shares will receive no interest until the road is in working order, but the preferred shares will be paid 4 per cent interest during the period of construction. The Canton Berne participates by the purchase of $3,300,000 subvention shares. The syndicate is composed of Swiss and French banks. It is expected that ultimately the Swiss federal railways will buy the Lötschberg. The work will commence at once.

A 12-horse-power four-cylindered petrol motor in America recently ran 87 miles on two gallons of petrol. The weight of the car was 1,500 pounds. Another car identically the same only ran 57 miles on the same allowance of fuel.

THE MAGIC SPHERE.

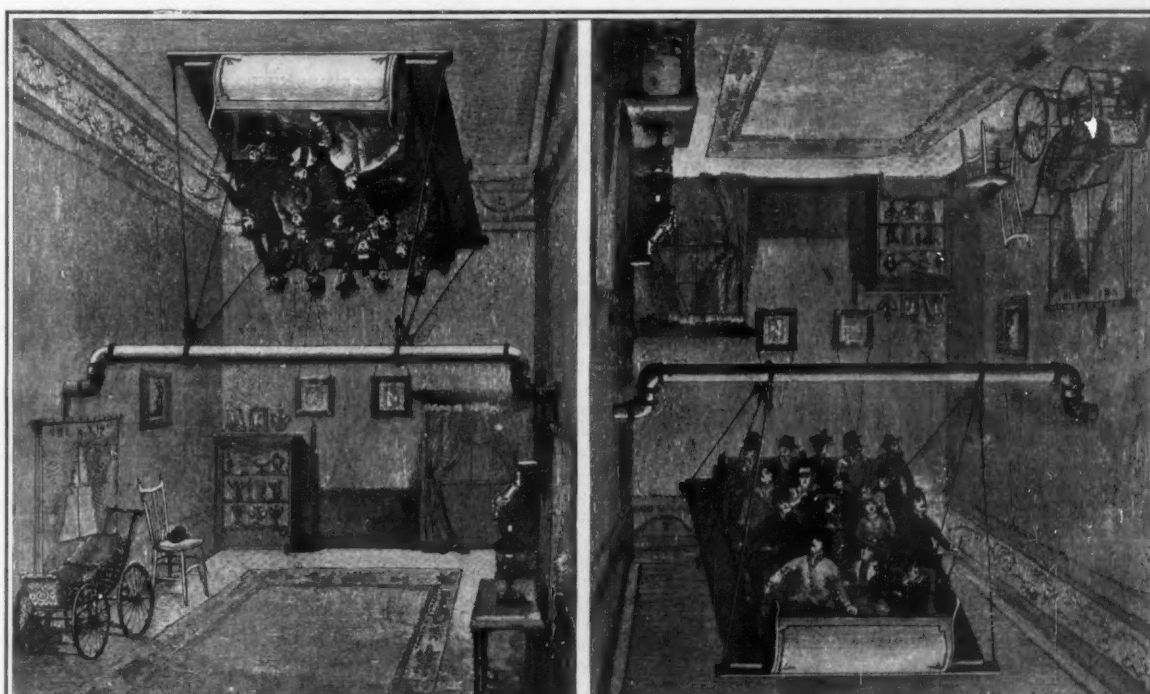
The article on the Magic Sphere, published in our issue of June 16, has brought to the editor's desk several letters, some of whose writers agree with the author of the article in his explanation of the magic sphere's curious properties, and others who side with the views expressed by the editor in the brief note appended to the article. By far the most interesting of these letters is one received from the inventor of the Magic Sphere, Sir Hiram Maxim. He writes as follows:

To the Editor of the SCIENTIFIC AMERICAN:

I have read the article on the Magic Sphere by Dr. Alfred Gradenwitz, which appeared in your issue of June 16, and also your comments on the same.

It seems that you do not altogether agree with the doctor's reasoning. I would say, however, that I furnished him with all the data connected with this invention, and that I feel quite certain that we do have stored somewhere in our head what you have so aptly termed "the gravitational sense organ." The apparent position of objects is not influenced in any degree by the inclination of the body, as you seem to think. We cannot account for seeing things right side up, quite irrespective of the position that the body is in, except on the hypothesis that we do have "gravitational sense."

Suppose, for example, that a man should be strapped onto the face plate of a large lathe, and very slowly revolved; the man would always see things right side up, quite irrespective of the position of his body. If we placed a man in a room lighted from the inside, and sling this room to a long arm capable of being rotated around a large circle, and if a plumb line was hung from the ceiling, the plumb line would always occupy the same position in relation to the room, whether the room itself was revolving around a circle or not. If the centrifugal force was equal to the pull of gravity, the plumb line would appear perfectly vertical to the man, and the floor of the room dead level although its true inclination above the horizontal might be 45 deg., and this quite irrespective of the inclination of the man's body. If the man was strapped to the rotating face plate of a lathe, it would not change the appearance of things in the least; the combined pull of gravity and centrifugal force would be the same, quite independent of the position of his body.



THE CAR IS STATIONARY, BUT THE ROOM IS ROTATABLE, AND ITS FURNITURE AND HANGINGS ARE FIRMLY SECURED. WHEN THE ROOM IS TURNED THE OCCUPANTS OF THE CAR IMAGINE THEY ARE CIRCLING IN THE AIR.

In regard to your saying that there would be no difficulty in walking in a diametrical direction, I would say that when one is standing at the extreme edge of the floor, he is traveling, we will say, at the rate of about fifteen miles an hour, and his body is endowed with a certain amount of *vis inertiæ* or momentum. Suppose now that he attempts to walk quickly to the center of the rotating floor; what is to become of this *vis inertiæ*?

Suppose, for instance, that he is in the center of the floor, and attempts to reach the extreme edge quickly; the floor will certainly have a tendency to run away from him, and if he did not brace himself very strongly, he would topple over. However, if the movement is slow, very little difficulty would be experienced, whereas one could always walk in a circumferential direction, either way, without feeling any influence whatever from the rotating floor.

After carefully reading the article, I find that all the statements therein contained are in exact accordance with facts that have been demonstrated by actual experiments. HIRAM S. MAXIM.

Thurlow Park, Norwood Road, West Norwood,
London, July 8, 1906.

If we understand Sir Hiram Maxim correctly, he contends that we owe our perception of the true position of surrounding objects to an unlocated gravitational sense organ, and that the presence of such an organ is demonstrated by subjecting the human body to the action of centrifugal force in order to counteract the effect of gravitation. In other words, if we can counteract the force of gravity, the organ will be deprived of its stimulus, and its existence will thus be proved.

We still adhere to the view which we expressed in the brief editorial note appended to the article, in which the principle of Sir Hiram Maxim's magic sphere was explained and illustrated. In that note we stated that we refer external objects to ourselves, and that we thus gage their relative positions. If we deprive the eye of the means of making this comparison by inclosing ourselves in a room which, as Sir Hiram suggests in his letter, is slung "to a long arm capable of being rotated around a large circle," we shall no longer be able to institute that comparison with objects outside of the room which would ordinarily inform us of their position and ours. Assuming that the room in question were provided with spacious windows, through which trees and houses could be seen, it is certain that no one would be deceived. That this is so is proved by Sir Hiram's flying machine apparatus, which constitutes one of the attractions of every American seaside resort. That apparatus consists essentially of a post, to the top of which rods are hinged, each carrying at its outer end an open boat fashioned to resemble an airship. When the post is turned, the boats revolve in a circle and are flung out to an angle of about 45 deg. with the vertical. The occupants of these open boats are influenced by centrifugal force; yet they still persist in seeing objects in their true positions, and are fully cognizant of their own inclinations. Why? Simply because they can compare themselves with the outer world.

If the gravitational sense organ existed, it should manifestly perform its functions in a windowless room when the body is not subjected to centrifugal force; in other words, when the supposed gravitational sense organ is unaffected. Several years ago we published in the SCIENTIFIC AMERICAN an illustration of an illusion apparatus which answers these conditions, and we reprint it as an argument against the existence of a sense of gravity. The apparatus comprises a room journaled on a horizontal shaft from which a car is suspended. Every movable object of furniture in the room is nailed down. When the room is turned on the horizontal shaft, the occupants of the car imagine that they are circling through the air, although in reality they are stationary. In order to heighten the illusory effect, the car was first pushed by an attendant, so that it was made to swing gently. The attendant then left the room. By causing the room to rock on its shaft, the car seemed to swing from side to side in ever-increasing curves, until finally, when the room was completely rotated, it seemed to its occupants to describe complete circles. So successful was the illusion in actual practice that men and women would anxiously clutch the sides of the car when the floor of the room was above them.

It is unfortunate that the expression "difficulty of walking" should have been brought into this discussion; for the curve of the floor has been so designed with reference to the speed of rotation, that a person, no matter where he stands on the floor, will without effort assume a position normal to the curve of the floor at that point.

If he stand at the center, he will be normal to the earth. If he move out say three feet from the center, he steps onto a portion of the floor that is moving in a circular direction, say from right to left, at a certain rate of speed. In his new position two new forces will act upon him; first, a centrifugal force, pulling him to the outside of the floor; second a circumferential force, acting from right to left to knock his feet from under him. The former, or centrifugal force, is provided for by the inclination of the floor, which is such as to throw his body toward the center sufficiently for this purpose. This is done independently of himself, and as far as his consciousness is concerned, is involuntary. The circumferential force he must counteract by a voluntary inclination of his body in the direction in which the floor is rotating. So far as the effort expended in walking up or down the parabolic floor is concerned, we still adhere to our original statement. We may consider the problem from three points of view: (1) When the centrifugal force is greater than the force of gravitation; (2) when the centrifugal force is equal to the force of gravitation; and (3) when the centrifugal force is less than the force of gravitation. In the first case a man will obviously be pulled out from the center to the circumference if he does not resist; in the second, he will be practically in the situation of a man walking on a level floor, as in the magic sphere; in the third, he will have to climb a hill, in other words, he will have to perform more work than in the first two cases. In all three situations he will perform an amount of work which, if we elaborate the well-known formula, is dependent upon his weight (the mass), upon the degree of curvature, and upon the speed of rotation, which last two determine his velocity. In all three cases he will seek instinctively to adjust himself to the mechanical requirements of his situation. The line passing from his head through his body represents the resultant of a combination of forces formed by gravitation and the centrifugal force of the rotating floor and the circumferential accelerating force. In other words, he is under the influence of a force acting normally to the floor, just as he is in ordinary circumstances. If in Sir Hiram's case he attempted to walk toward the center of the floor without thus adjusting his position, we concede that it would be hard for him to walk. Similarly he would find his progress from the center toward the outer edge facilitated by centrifugal force. It is inconceivable, however, that any man would select the most cumbersome method of moving inwardly. He would instinctively tilt himself forward, just as he does when standing in a train rounding a curve.

The Current Supplement.

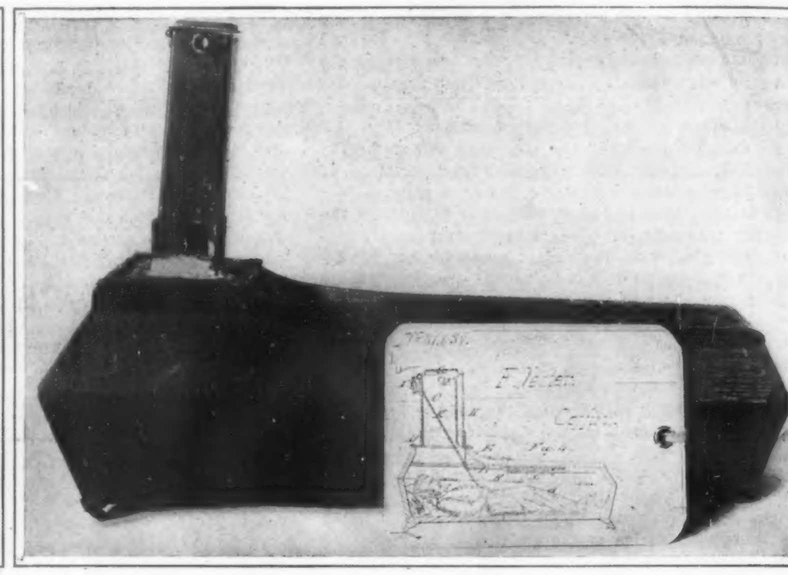
The current SUPPLEMENT, No. 1597, opens with an article on the Concrete Railroad Bridge at Danville, Ill. The article is illustrated with photographs of the bridge in course of construction. Attempts at smoke abatement are almost as old as the art of burning fuel itself. Mr. Wm. H. Bryan discusses its various phases. A new duplex four-cycle gasoline motor is described and illustrated in an article by the Paris correspondent of the SCIENTIFIC AMERICAN. Prof. J. S. Shearer writes on some properties of matter at low temperatures. Coke Oven Gas is the subject of an article by C. G. Atwater. Friedrich Guenther asks: "Is the Age of Bronze a Myth?" and shows that it is. A very valuable paper on amalgams is published. Lieut. White gives an account of the naval battle at Tsushima. Another installment on "Tinning" appears. Prof. William H. Hallock tells how tides are predicted.

THE MUSEUM OF PATENT OFFICE MODELS.

BY EDWARD W. BYRN.

A piece of legislation for which the last Congress is responsible, and for which no excuse can be found other than a misapplied effort at economy, is the reduction to $10,000 of the annual rent paid by the government for the preservation of Patent Office models in the Union Building at Washington. Inasmuch as the rent paid in previous years has been nearly twice the sum appropriated, some curtailment of the museum's expenses was rendered necessary, and the Secretary of the Interior instructed the Commissioner of Patents to ascertain the condition of the models and to adopt some means of disposing of them. The result was the appointment of a committee of Patent Office examiners, who have fully investigated the matter and will soon submit their report.

ONE OF THESE CHAIRS IS PROVIDED WITH A BELLOWS TO BLOW AIR IN YOUR FACE, THE OTHER HAS A FAN TO BRUSH THE FLIES FROM YOUR HEAD.



A MAN COULD NOT BE BURIED ALIVE IN THIS COFFIN. HE COULD BREATHE AND COULD RING A BELL TO CONVINCE PEOPLE HE WAS ALIVE.

Pending the action of the committee, a storm of protest has arisen against this disintegration and partial destruction of the exhibit. Voicing this protest most strenuously, the Patent Bar Association has by its representatives appeared before the committee and urged the preservation of the exhibit, arguing that it is practically impossible to establish any standard or guide by which to determine the relative importance of the various models, and that none of the models which form part of a patent should be disposed of if it is in such condition as to be useful as a record. There seems no way of determining which models will be of importance in the future, for no human being can say authoritatively but that a model which seems of the least importance to-day may be of the greatest importance to-morrow. There is a present demand and necessity for the models as record evidence in patent litigation.

There are of course some models which through accident or age have become so mutilated as to serve no useful purpose as a record, and these may well be disposed of. There are also about 2,500 models filed as exhibits but not made a part of the record of any patent, and these may be disposed of.

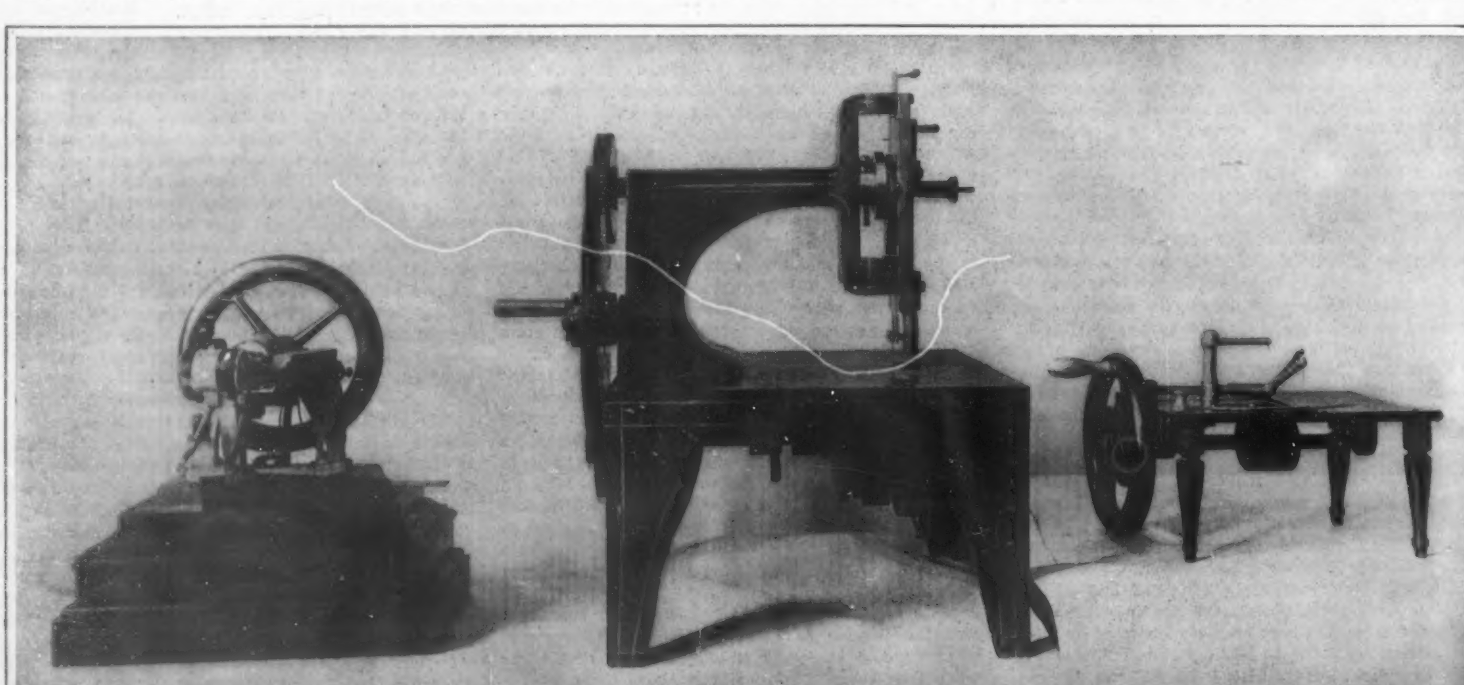
In the early history of the law particularly, in many instances the drawings were sketchy and incomplete, and reliance for the disclosure of details was placed upon the model. They are, therefore, not mere duplicates, but supplemental disclosures. The model, therefore, became an indispensable part of the record of those earlier patents.

The question as to what disposition will be, or should be, made of these models is still an open one. It will be remembered, on the one hand, that this collection of models is not a complete exhibit of all the patents granted. All models prior to 1836 were burned, and only a few have been restored. In the Patent Office fire of 1877 some 86,000 additional models were burned, leaving about 157,000 models. On the other hand, the models remaining and now on exhibition in the Union Building represent some of the most important epochs of progress which have marked the growth of modern civilization, and it is the only exhibit of the kind in existence. Here are to be found the sewing machines of Howe, Wilson, Singer, Grover & Baker, Willcox & Gibbs, and others. The Howe machine in 1846 for the first time placed the eye of the needle in the point instead of the heel, and this, with the four-motion feed of Wilson, gave the first practical success to sewing by machinery. Here also are Morse's telegraph patents, 1832-1840; the Bell telephone patented in 1876, the Edison phonograph patented in 1878, Edison's electric lamp patented in 1880, the House printing telegraph of 1846, the Bain chemical telegraph of 1848, Dr. Page's electro-magnetic engine patented in 1854 and his induction coil of 1868, Channing & Farmer's fire-alarm telegraph of 1857, Eli Whitney's cotton gin of 1794, the Blanchard lathe of 1820, Thurber's typewriter of 1843, and many others.

In printing, the array and perfection of the models in presses and allied arts is particularly fine, the work of Hoe, Bullock, Gordon, and others being presented in beautiful and operative models. In looms and the textile art generally, there are also illustrative models of perfect workmanship. So also in locomotives, cash registers, knitting machines, machines for making needles, nails, and horseshoes, and many other complex machines. The time lock of Savage of 1847, the arc lamp of Collier & Baker of 1858, the electro-magnetic engine of Stimson in 1838, and the old electric motors of Davenport, Neff, Edison, and others are all here.

Many curious and historic inventions are to be found in the collection. Abraham Lincoln's Means for Lifting Vessels over Shoals was patented May 22, 1849, and is represented by a good model; Sonnenberg & Rechter in 1852 patented an electric device for killing whales; Edison, on June 1, 1869, took out his first patent, which was for an electrographic voting machine.

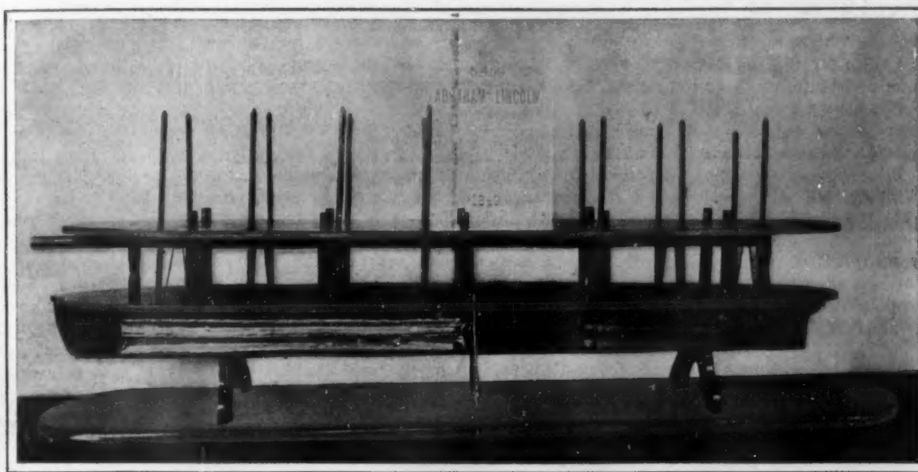
Prominent in the exhibit of models are several thousand grouped together in separate cases, being the inventions of women. One would naturally suppose that these would lie in the sphere of a woman's work, and many of them do. Sally Rosenthall invented a pocket sewing machine, which she could take along with her when visiting, and thus improve each shining hour with both work and gossip. Mary Carpenter invented a machine for sewing straw hats, and is reputed to have made much money out of it. Margaret Knight invented a feeding machine for making paper bags,



The Howe Sewing Machine. Singer Sewing Machine. Wilson Sewing Machine.

THREE EPOCH-MAKING IMPROVEMENTS IN SEWING MACHINES.

and is credited with considerable profit therefrom. Frances Dunham was the inventor of a machine for making honeycomb, shrewdly recognizing the assistance this would render the bees. Not all of the women, however, have confined themselves to lines of



ABRAHAM LINCOLN'S "MEANS OF LIFTING VESSELS OVER SHOALS."

feminine thought. Mary Montgomery, with the memory of the civil war fresh before her, invented in 1864 a very mechanical double-hull construction of war vessel, and Sarah Mather in 1845 devised a submarine telescope, while Mary Woodward in 1849, probably with an eye to the comfort of a bald-headed spouse, invented a fan to be attached to the rocker, so as to keep off the flies as well as fan the occupant.

Prosaic as is the work of mechanical evolution, many curious and amusing lines of thought crop out in the work of the inventor. Two men in 1862 together invented a plow gun, in which the beam of the plow was fashioned as a cannon. One of the inventors was perhaps a farmer and the other a soldier, and the implement in the field was ready for either peace or war. Another in 1887 secured a patent for an aerial car with live eagles for a team. Naturally a working model could not be supplied, and we must take the patentee's word for the operativeness of the invention. A melancholy philosopher in 1880 molded the ashes of the cremated dead into a memorial statue or vase. An industrious man who attempted to follow out Franklin's custom of rising early, in 1855 patented a bedstead adapted to throw the sluggard on the floor at getting-up time. A Beau Brummell in 1896 patented a self-tipping hat which makes a polite salutation. Here, too, a model was dispensed with. A tender-hearted man in late years has patented an eyeglass for chickens, another in 1854 patented a tapeworm trap, which was to be swallowed and the trap then removed. A recent inventor coats the dead body with glass for preserving it, another has an electric device for stopping runaway horses. Another attaches a parachute to a man's head and weights to his feet, so that he may jump out of the window in time of fire and land safely. A lover of feminine beauty has provided a dimple maker. An anti-snoring device is supplied by one whose trials are thus expressed with mute eloquence. An anti-scratching device for chickens was the basis of an application for a patent by a lady in 1863, but was never issued. An illuminated keyhole surrounded by luminous paint which shines at night was the subject of another patent, unexemplified, however, by a model. This enables the unsteady man to find the keyhole. A cheek expander, a hair parter, and an electric lamp to be swallowed so as to illuminate the interior anatomy have all been patented, and many more amusing instances might be found. Many of these are of course not represented by models, but are here mentioned as instances of the humorous side of inventions.

Yet these exceptional lines of thought do not all represent absurd or ridiculous vagaries, as most of them are useful, and many of them make valuable contributions to the sum total of knowledge.

Experiments Upon Dogs.

Under the heading "Reconstituent Effects of Raw Meat," L'Illustration (Paris) has the following:

"To determine the reconstituent effects of raw meat Dr. Charles Richet fed differently from August 10, 1905, to February 1, 1906, six groups of four dogs and one group of three. The first group received alternately cooked horse-meat and a boiled mash composed of rice, milk, and sugar; the second received, by turns cooked meat and raw meat; the third, cooked meat and lactated cheese (Gruyère cheese cooked with milk). The alternations were of five days. The other groups were subjected to fasts of five consecutive days, then fed during five days—group four with cooked meat, group five with raw meat, group six with the mash, group seven with lactated cheese. In the first five series, aside from accidental deaths, the dogs remained in excellent health; in the fifth, they supported extremely well the alternations of fasting and feeding. The four subjects of the sixth series died successively the 35th, the 36th, the 60th, and the 83d day. Finally, of the three dogs of the last group two died on the 71st and the 175th day.

"The result would seem to be that meat is indispensable for the repair of muscle weakened by starvation. Moreover, raw meat should be in this respect very superior to cooked meat. As for the dogs subjected to the fasts, the average of the differences between the gains and the losses in weight at the end of each alternation was a loss of 1.7 for the dogs fed on cooked meat, 0.2 for raw meat, and 4.5 for mash."

Cars Which Had Perfect Scores in the Glidden Tour.

The cars which lost no points whatever in the contest for the Glidden and Deming trophies are given below:

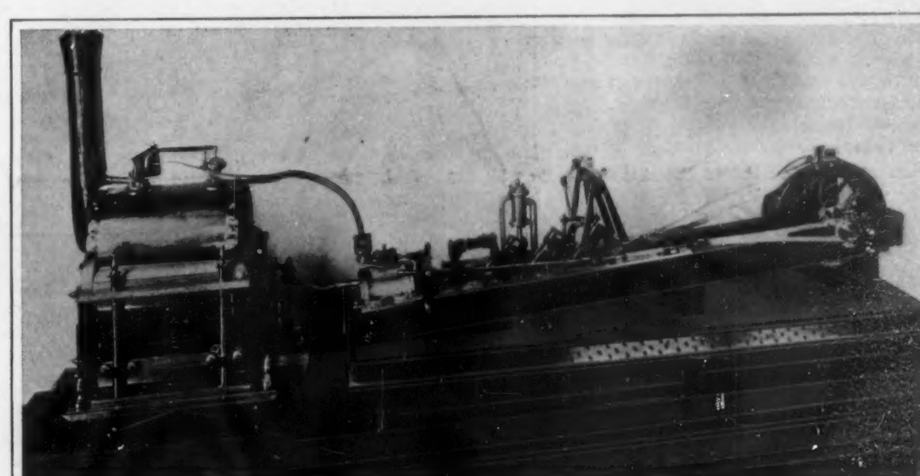
FINAL SCORE, GLIDDEN TOURING CONTEST.

P. P. Pierce, Buffalo, Pierce, 45 horse-power; A. E. Hughes, Philadelphia, Pierce, 45 horse-power; P. S. Flinn, Pittsburg, Pierce, 32 horse-power; G. M. Davis, Buffalo, Thomas, 50 horse-power; L. J. Petre, Cleveland, Stearns, 40 horse-power; George Soules, Toledo, Pope-Toledo, 40 horse-power W. C. Walker, Hartford, Pope-Hartford, 25 horse-power; W. E. Wright, Springfield, Knox, 40 horse-power; C. F. Barrett, Hartford, Columbia, 28 horse-power; Ernest Keeler, Lansing, Oldsmobile, 30 horse-power; C. Burman, Cleveland, Peerless, 45 horse-power; F. E. Wing, Boston, Marmon, 30 horse-power; G. G. Buse, Buffalo, Packard, 24 horse-power.

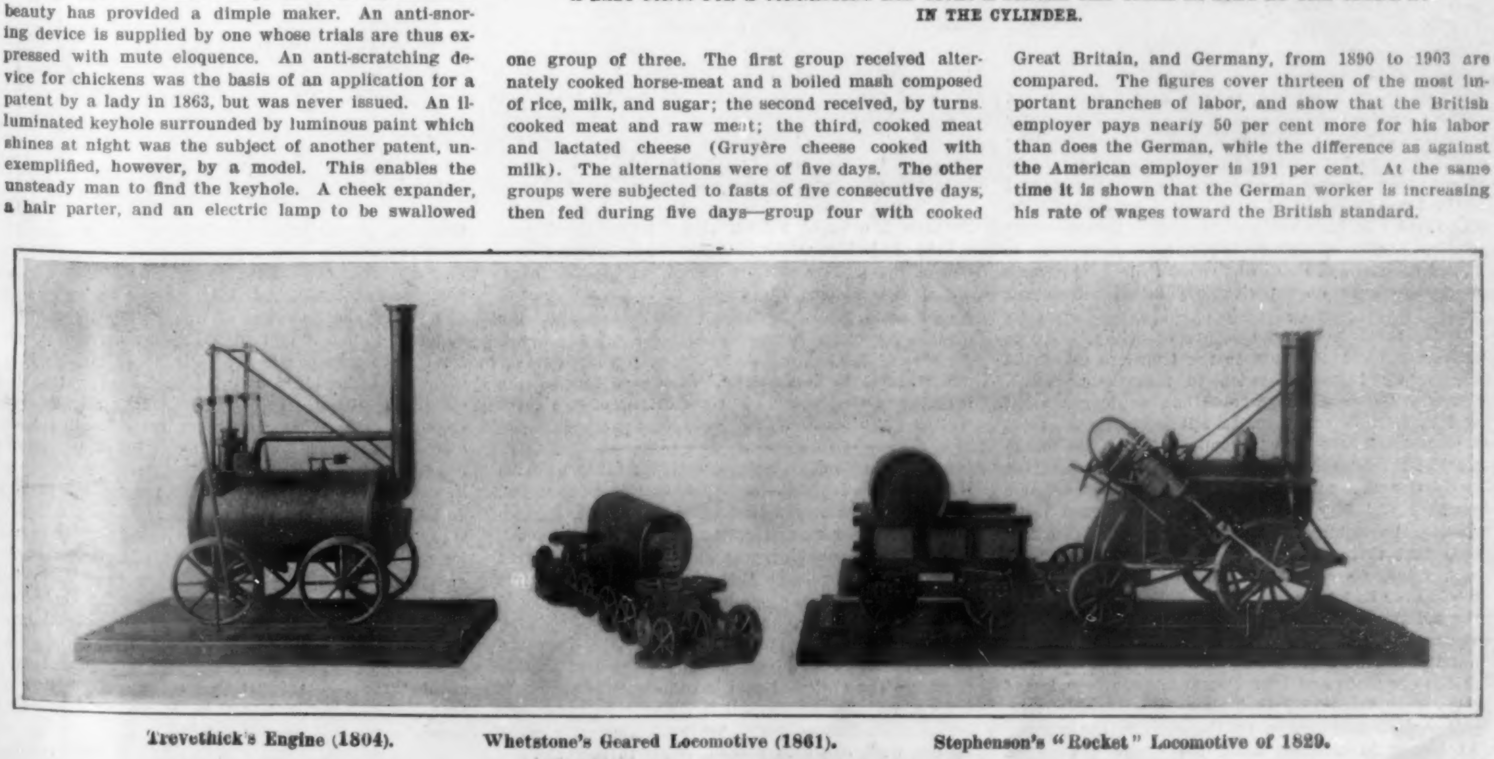
FINAL SCORES IN THE DEMING CUP CONTEST.

C. W. Kelsey, Tarrytown, Maxwell, 36 horse-power; A. A. Post, New York, White, 18 horse-power.

The United States Bureau of Labor has issued a bulletin in which the rates of wages paid in America, Great Britain, and Germany, from 1890 to 1903 are compared. The figures cover thirteen of the most important branches of labor, and show that the British employer pays nearly 50 per cent more for his labor than does the German, while the difference as against the American employer is 191 per cent. At the same time it is shown that the German worker is increasing his rate of wages toward the British standard.



A LAZY-TONGS FOR A CONNECTING ROD GIVES A STROKE TEN TIMES AS LONG AT THE CRANK AS IN THE CYLINDER.



Trevethick's Engine (1804). Whetstone's Geared Locomotive (1861). Stephenson's "Rocket" Locomotive of 1829.

THREE INTERESTING PATENT OFFICE MODELS.

The Danger to Greenwich Observatory.

BY CHARLES STIRRUP.

The welfare of Greenwich Observatory is a matter of international interest and importance, even if for no other reason than that the famous institution overlooking the Thames is accepted by the whole world as a standard meridian. In scientific circles in particular much concern is being felt for the observatory, for its usefulness, its very existence even, is threatened by a huge electric power house which has lately been erected half a mile away due north by the London County Council. The case is set out at considerable length in the London Times by Prof. H. H. Turner, of the University Observatory, Oxford, who was formerly on the Greenwich staff and is now a member of the Board of Visitors. He says that "the disturbance caused by the hot air and smoke from all the chimneys (of the power house) cannot fail to be serious, though it is at present impossible to estimate it quantitatively. But there is another source of disturbance of an alarming kind, of which direct evidence has already been obtained. In spite of various precautions taken, the engines of the generating station are so powerful that they shake the observatory. The delicate observations for radii, which furnish the reference points for Greenwich time and for terrestrial longitudes, indicate a state of constant vibration while the engines are running, which will be greatly increased if the full proposals of the London County Council are carried out. By the invitation of the Astronomer Royal I paid a special visit to Greenwich, . . . and was able to compare for myself the state of matters during the running of the engines and after they had stopped. The observations left no room for doubt as to the seriousness of the disturbance."

The clash of interests brought about has naturally given rise to a number of suggestions on the part of laymen which, also naturally, are more or less impracticable. The issues at stake, as Prof. Turner puts it, are not properly understood by those who are unfamiliar with astronomical work of the kind which has made Greenwich famous. He goes on to say:

"The mischief that arises from tampering with a standard is even greater *in posse* than *in esse*. But it is, at the same time, very difficult to state concisely. I have been often asked whether it would not be better to move the observatory away from Greenwich, and it is almost impossible to state the objections in a manner commensurate with their importance. Suppose one were asked whether the pictures in the National Gallery could not be replaced by a set of well-made copies, it would be very difficult to state the objections in adequate language. One might lose one's temper and retain general sympathy; but a person who happened to be ignorant of art, and unwilling to accept public opinion, would not be convinced. There is a similar difficulty in explaining to those unfamiliar with science the impossibility of copying a standard—say the standard of length—and the consequent necessity of guarding it with the greatest care; and unfortunately in this case one cannot to the same extent take refuge in public support, since there are not so many who are sufficiently acquainted with the countless small details which make up the argument. To explain the issues involved in moving Greenwich Observatory is more difficult still; it could, no doubt, be done with time and patience, but to have to do it in the witness box under cross-examination might well make the stoutest heart quail. Is it unreasonable to ask those who have not time to acquire the necessary preliminary knowledge of fundamental astronomy to accept the views of those who spend their lives in such work and have no conceivable personal interest at stake?"

Quite apart from the question of utility, there is the sentimental objection to the transference of the observatory from Greenwich to some other place. Greenwich Observatory would then no longer exist, and we have to remember that it is by far the most famous institution of astronomical observation in the world. Established in 1675 for the advancement of navigation and nautical astronomy, it stood for one hundred and fifty years absolutely without a rival. During the eighteenth century it was at Greenwich only that there were systematic observations of the sun, moon, stars, and planets, and astronomers the world over had to work from material supplied from the building at the top of the hill in Greenwich Park. It was at Greenwich that the aberration of light, the nutation of the earth's axis, and other famous discoveries were made and from Greenwich has been issued every year since 1767 that almost incalculably valuable compilation known as the "Nautical Almanac." At Rome, in October, 1883, the Geodetic Congress recommended the international unification of the hour and longitude with Greenwich, and just twelve months later forty delegates assembled at Washington agreed to the Royal Observatory being the prime meridian, the respective representatives of France and Brazil only abstaining. Greenwich Observatory belongs not merely to England, but to the world.

The Deutsch Aeronautic Prize.

The rules for the Henri Deutsch Cup, which is the leading aeronautic event of the season, have been decided upon at a recent meeting of the Sportive Commission of the Aero Club of France, and were presented by the special committee which was charged with the affair. According to the regulation, the Henri Deutsch Aeronautic Cup, which is a work of art having the value of $2,000, is to be awarded to the first aeronaut mounted on an airship or aviator who shall have made the circuit including St. Germain, Senlis, Meaux, Melun, St. Germain, in the region of Paris, without taking on supplies, in the direction and order which he may desire. The length of the circuit passing through the above localities is about 120 miles. The descent is not indispensable at the terminal point of the circuit, and it suffices to have closed the circuit above mentioned. As to the date of the start, the competitor is free to choose it, within the eight months of each year from March 1 to October 31. The trip is to be made between sunrise and sunset. At the end of eight months the competitor who has not been distanced is to return the cup to M. Henri Deutsch, and will receive in exchange the sum of $4,000 in cash. To have the cup change hands, the speed made by the second comer must be 10 per cent over that of his predecessor. The competitor who shall become the third holder of the cup under these conditions, will keep it definitely as his own property, outside of the prize of $4,000 which he will receive like his two predecessors. The rules are now fixed in the general lines, and only a few details remain to be decided upon. It is considered that the cup will have a great influence in promoting the question of airships and aeroplanes in France. Another prize which has recently been announced relates to an international concourse of airships which is to be held at Ostend Beach, one of the leading summer resorts on the Continent, during the season. The details of the event are not as yet made public, but it is stated that most of the leading aeronauts have promised to enter the event. A prize of $10,000, which is one of the largest ever offered, is to be awarded by M. Georges Marquet, the manager of the Casino. Further details of this event will be given shortly.

American Flamingo Brooding and Feeding Young, an Example of Modern Taxidermy.

Another crate of submerged coal was taken up from No. 2 basin in Portsmouth dockyard and is to be tested. It will be remembered that on May 16, 1903, the Admiralty ordered several crates to be filled with coal, each holding two tons, and all were lowered to the bottom of the basin on that day. At the same time several heaps of coal of similar description were placed on the coaling island and covered up, the object being to ascertain whether submerged coal retains its calorific properties better than that not submitted to this process. The crates of coal have been left submerged for various periods, and all previous tests have been in favor of the sea water process. The crate taken up last week had been submerged for three years.

THE MODERN TAXIDERMIST AND HIS ART.

BY B. S. BOWDISH.

Taxidermy is an art, and a science as well, and the present generation has revolutionized its methods and the ideals. The general idea of taxidermy has always been to preserve examples of wild life. Formerly the method was to place an awkwardly-mounted bird on a polished wooden pedestal or perch, and both bird and mount might have been carved from one piece of wood, for all the semblance of life. Sometimes one or more stiff specimens were placed in a case with an equally stiff and unnatural-looking collection of dried grasses. To-day the great aim of scientific taxidermy is to take a slice out of the wild life itself and place it in the museum, where for generations to come the people of the future as well as those of the present may see creatures of other portions of the globe, or such as may in their day have become extinct, apparently in life and enjoying their own chosen environments.

The American Museum of Natural History, of New York city, has been a pioneer in this, the new taxidermy. During the period when the late Jeness Richardson was chief of the taxidermy department, these group cases showing the home life of a pair or more of birds of some species began to appear.

At that time the late Mrs. Mogridge was introducing her methods of accessory work, which beautifully supplemented the fine skill in lifelike mounting of specimens with very perfect reproduction of natural environment in every detail. One of the early cases of this style was a group of little blue herons, with their nests, eggs, and young, in a mangrove. These nests were taken in the mangrove swamps of Florida by Mr. Richardson, packed, and brought North. In addition, the bushes in which they were found were collected, cut in sections, numbered, and brought home with the nests. The result was that the materials that made up the scene in the Florida swamp were transported into the New York museum, and there accurately reproduced the same scene to the smallest detail.

Since Mr. Richardson's time these methods of reproduction of the home life of natural groups of wild birds have been elaborated and developed. Mr. Frank M. Chapman, Assistant Curator of Birds and Mammals of the Museum, has the supervision of this work. For the past few years an attempt has been made to obtain material for cases of such birds as were getting scarce and liable to become extinct, or of groups whose natural habitat made them inaccessible to the observation of the general public. With this end in view, Mr. Chapman has made summer excursions to the haunts and breeding grounds of such birds, and there has gathered as exhaustive series of photographs as possible, showing the details of their home life, in addition to specimens and other material for cases and very complete observations on conditions and habits. These have contributed to the public knowledge, not only by means of the object lessons that the cases afforded, but by illustrated lectures and magazine articles as well, for which the photographs furnished illustrations. Had such a course seemed feasible to the museum scientists of a generation ago, several species of birds which have since become extinct, and of which we now know very little, might be represented in accurate group cases in the museums illustrating their habits and environments, while our libraries would give us facts where now we have little more than conjectures.

In the summer of 1904 Mr. Chapman secured the material, photographs, and studies for one of the most remarkable groups that has ever been presented to a nature-loving public. Ever since the American flamingo had been known, there had been an element of mystery about the life of this striking bird. Eggs had found their way into the stocks of dealers, and from there into our boyish collections; rumors came to us that the birds built adobe homes which they straddled, with their long legs dangling awkwardly on either side. The flamingoes are exceedingly shy and retiring birds, and had often defied the efforts of the gunner to secure them, yet Mr. Chapman succeeded in erecting a blind, right in their very midst, making an elaborate series of photographs and a very complete study of the birds, natural and at ease in their homes. He exploded the notion that the flamingoes, while incubating, straddled the nest, his photographs showing the birds sitting on top of their nests with their long legs doubled under them in a perfectly normal manner. The tops of the nests may measure nearly a foot in diameter, while the bird's legs are placed only about three inches apart, hence such a position as that formerly ascribed to them is readily seen to be incongruous.

Almost at arm's length Mr. Chapman observed the

birds as they fed and brooded their young, incubated their eggs, slept on their nests, toyed with bits of wood to relieve the monotony of household cares, and stood on one leg while they preened their plumage.

The breeding grounds of the flamingoes are among the low, flat, uninhabited islands of the Bahamas, places appropriately termed "swash." Here shallow waters, the small crustacea on which the birds feed, and the marl from which they chiefly construct their adobe homes, combine in abundance; and where isolation affords the birds some promise of immunity from persecution, these birds make their abode.

It must not be inferred, however, that "they all lived happy ever after." In this land of tropical rains and fierce wind storms, the homes of an entire colony are liable to be inundated and wrecked, just as newborn life is about to reward the long and patient labors of incubation. Again, Mr. Chapman, after recording the fact that the rookery which he visited was later largely destroyed by negroes before the breeding season was over, says: "This, indeed, is doubtless the fate of every flamingo rookery in the Bahamas the whereowes to the combined scientific skill and the zeal, ardor, and unfailing enthusiasm of the naturalist, who, braving the dangers and hardships in the wild tropic isles, transports a group of these noble birds with their native environment and all the details of their home lives, almost living, breathing creatures in the perfection of their lifelike simulation, and plants it in the heart of the great metropolis, where the toilers, weary of the city's grind, can pause and gaze on one of nature's beautiful works?

Until a very few years ago the smaller seabirds were being slaughtered by the hundreds of thousands yearly to supply the millinery trade, while from the feeding grounds along the coasts, spring and fall, the sandpipers and small waders were shipped by the barrel to the game markets. At the time of the systematic organization of the Audubon movement, utter extermination threatened the least common, roseate, and other terns, the laughing and herring gulls, and in fact nearly all the bird life of the coasts. Before a check was brought to bear on the destruction, the numbers of many of these birds that once swarmed in countAmerica and shipped North, many of them to die. The cases, then, that represent all of these and many others are the only glimpse of their domestic economies that thousands of people will ever have, in fact are the only chances that most people will ever have to view the birds themselves. No other art has ever succeeded in so closely reproducing nature, and no reproduction can offer wider possibilities in the way of public education.

California's Grape Industry.

Upward of 250,000 acres are devoted to grape culture in California, which State produces more than two-thirds of the entire grape output of the country, the annual production of wine being over 30,000,000 gallons. At a conservative estimate the raisin and wine industries of California, in vineyards, cellars, cooperage, distilleries, machinery, and capital to carry on the business, represent an investment of at least $85,000,000. The dry and sweet wines produced in the last ten years amount to 255,000,000 gallons, an annual average of 25,500,000 gallons, and the brandy

Young Black Tern in Second Plumage.

Redhead Ducks.

Flamingoes Nesting.

Black-Neck Stilt Adult and Young in Final Plumage.

A Breeding Colony of Flamingoes.

THE MODERN TAXIDERMIST AND HIS ART.

abouts of which becomes known to the always half-starved negroes."

To these dangers must be added the most unaccountable of all, the certainty that no tourist with a firearm will lose a chance to destroy the beautiful and interesting creatures with which nature has gladdened the earth.

Thus where once existed many of these rookeries, sights to furnish truly "red-letter days" in the lives of the fortunate beholders, never to be forgotten, it is now a labor of long and patient search if the investigator is so lucky as to locate a single breeding ground. This bird is slowly passing before the inexorable advance of civilization, with its inexplicable, wanton destruction, and it seems likely that the time will come when even those wild, waste spots of the earth where these creatures have taken their last stand shall know them no more. Like the American buffalo and the American Indian, though once they peopled this land in almost countless numbers, yet a future generation shall know them in history only. Is it not, then, a fact that the public fails properly to realize what it less hosts were so reduced that they will probably never recover, and some of them will doubtless gradually disappear forever. There is, therefore, the same interest in the lifelike cases of all these species that attaches to the bit of flamingo home life represented there.

Standing before this flamingo case, and shutting out all but the scene in front, one can lose one's self in the "swash" of the Bahama Islands, and so with the other scenes of bird life thus portrayed.

The redhead duck, in common with most others of its family, is now rare or wanting in many localities where once it abounded. As the swamps that formerly furnished nesting sites for the black-crowned night and other herons are drained and denuded of timber, the range and numbers of these birds are inevitably reduced, and it becomes harder and harder to find a rookery. In the northern and more settled part of its range the black-necked stilt becomes more and more of a straggler, as the greater numbers fall back on the semi-tropical southern range, where they are trapped by the natives of the West Indies and South produced during the same time amounted to about 26,850,000 gallons.

Preparations are being made in Italy for the Brescia circuit race for the Florio Cup, which is to be one of the most important racing events of the season. It will be held during next September. The route which has been selected is of an oval form and is much shorter than last year's course. It will allow the highest possible speeds, as the road is to be put in the best shape, and there are many long straight portions and but few sharp turns. The Westrumite road-treating process is to be used over the whole course, and this can be easily done, seeing that the total distance is only 58 miles for one round. There are no neutralized places nor grade-crossings. From Brescia, where the cars start and the main tribunes are to be erected, the route passes by Castendolo and Montechiari, then makes a turn through Castiglione, running northward to a point near the Lac de Garde and returning to the starting point by way of Lonato. Count Bettoni is at the head of the local committee.

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Inquiry No. 8267.—For manufacturers or jobbers of a hand or tubular lantern using calcium carbide to produce the gas for fuel in same.

Inquiry No. 8268.—Wanted, address of Follett Steel Numbering Machine Co.

Inquiry No. 8269.—For manufacturers of galalith, a substance entering into the composition of combs, buttons, etc.

Inquiry No. 8270.—For manufacturers of machines for knitting tapes, etc.; also manufacturers of brass tips for shoe latchets.

Inquiry No. 8271.—For manufacturers of gum-vending machines.

Inquiry No. 8272.—For manufacturers of machinery for making refuse hardwoods, sawdust, etc., into alcohol and other by-products.

Inquiry No. 8273.—Wanted, address of party handling warrenite, which is a clay produced in Ohio.

Inquiry No. 8274.—For manufacturers of machines for assembling wooden cases of different sizes.

Inquiry No. 8275.—For manufacturers of square root angles.

Inquiry No. 8276.—For manufacturers of machinery for the turning of spools, such as ordinary sewing thread is wound on.

Inquiry No. 8277.—For manufacturers of machinery for making dry pressed brics and tiling out of mineral, so that they do not require burning afterward.

Inquiry No. 8278.—Wanted, address of Goodnow & Wightman, dealers in models and tools, formerly of 63 Sudbury St., Boston, Mass.; also manufacturers of model engines and boilers in Boston.

Inquiry No. 8279.—For manufacturers of portable machines for making concrete pipes, hand machine preferred, and pipes should be 6 inches to 15 inches in diameter, more or less.

Inquiry No. 8280.—For manufacturers of sand lime brick machinery.

Inquiry No. 8281.—For manufacturers of glass tubes about 12 inches long, ½ inch outside diameter and 5-16 inch inside diameter.

Inquiry No. 8282.—Wanted, names and address of parties making bronze tablets.

Inquiry No. 8283.—For manufacturers of roll paper holder and cutter.

Inquiry No. 8284.—For manufacturers of fish nets.

Inquiry No. 8285.—For manufacturers of boring machines.

RECENTLY PATENTED INVENTIONS.

Of General Interest.

ORE-SEPARATOR.—S. J. Rogers, Bingham Canyon, Utah. An inclined frame is employed, associated with which is an endless traveling belt, onto which the ore pulp or slimes is fed or supplied, means being employed for delivering the material to the belt and other means for so washing the pulp or slimes upon the belt as to more readily effect separation of minerals therefrom by causing the tailings to flow or pass from the belt in a direction opposite to that in which the minerals are conducted.

LEVEL.—J. L. Russell, Andersonia, Cal. In the use of this device one of the end sections is placed at the point to which the level is to be referred. The opposite terminal is then carried to the place at which the level is to be fixed, the length and flexibility of the tube permitting this, and raised or lowered until the liquid at both ends stands at corresponding marks upon the scales. This fixes the desired level. The scale in connection with the tube may be employed in the ordinary way for measuring distances or heights.

EXCAVATING APPARATUS.—R. B. Page, Los Angeles, Cal. A reversible scraper is employed having two cutting edges and adapted to be handled in an operative condition on each trip back and forth across the ditch, canal, or other ground to be removed. Means are associated with the scraper for holding it in operative condition during the excavating and loading operation and when fully loaded, said means being also effective in dumping the scraper when it reaches the point of discharge.

SQUARE.—A. W. Hight, Ballard, Wash. The invention relates to a carpenter's or other mechanic's square; and it resides particularly in a beveling device applied to the stock of the square. Used as a square, the beveling-arm is pushed between the plates of the stock, and interferes in no way. To use the arm, the elbow-lever is operated to relax pressure of the offset part on the arm, and then this arm should be drawn out to adjustment desired, either of two scales being referred to to determine adjustment. After adjustment the beveling device should be locked by the elbow-lever.

Household Utilities.

CURTAIN-FIXTURE.—T. Lauther, Tarentum, Pa. In this instance the invention relates to improvements in fixtures for supporting window shades and curtains, the object being the provision of a fixture of very simple construction that may be readily attached to a window-casing and adjustable to different widths of casings.

Machines and Mechanical Devices.

ATTACHMENT FOR GRINDING-MACHINES.—G. E. Buck, Newburg, Iowa. The principal objects of this inventor are to provide means for mounting disks or cutters in proper relation with respect to an emery-wheel or other grinding device in such a manner that work will be perfectly done without attention except for removing the disk when sharpened; also to provide means for varying the degree of pressure between the cutter and the grinding-tool, and to provide for accurately holding the cutter in position and adjusting its support to and from the grinding device.

RIMMING-MACHINE.—G. A. Ensign, Defiance, Ohio. The object of the present invention is to provide certain new and useful improvements in rimming-machines whereby the tenons of the spokes are brought into proper alinement with the apertures in the rim-sections immediately previous to the reciprocating starting-plunger driving the rim-section onto the first portion of the tenon. It relates to woodworking-machinery, and more particularly to rimming-machines—such for instance as shown and described in the Letters Patent of the United States, No. 733,826, granted to Mr. Ensign.

Note.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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